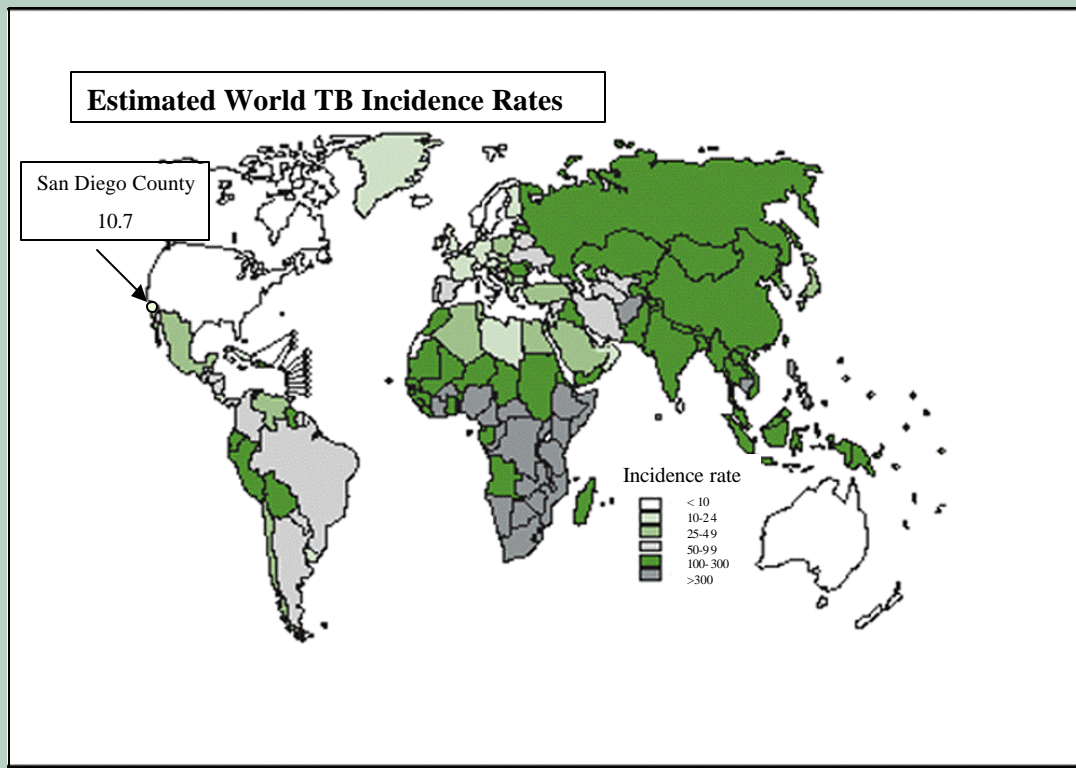




County of San Diego
Health and Human Service Agency
Office of Public Health

Tuberculosis Control Program 2002 Annual Report





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Introduction

Tuberculosis (TB), an infectious disease caused by the bacterium *Mycobacterium tuberculosis*, is one of the leading infectious causes of death in the world today (see cover for estimated case rates by country). It is estimated that one third of the world's population is infected with TB .

In the United States (US), TB was the leading cause of death in 1900. With the advent of effective treatment, the US experienced a steady decline in cases until the mid-1980s. A resurgence of TB occurred at that time, with national case rates peaking in the early 1990s. Extensive public health interventions at the national, state, and local levels have resulted in a continuous decline in TB over the last decade. In 2002 this national trend continued with the fewest reported cases in the US since 1953, the first year TB statistics were systematically recorded.

Case Counts and Rates

Following a 29% case decrease from 1993 to 1997, San Diego County has had a relatively stable number of cases over the past six years. In 2002 San Diego County reported 326 TB cases, with a case rate* of 10.7 per 100,000 (Figures 1 and 2). This represents a 1.8% decrease in cases and a 9.3% decrease in case rate from the previous year. In 2002, 15,078 TB cases (case rate of 5.2) were reported in the US and 3,169 cases (case rate of 9.0) were reported in California, representing 5.7% and 4.8% decreases from 2001 case counts for the US and California, respectively.

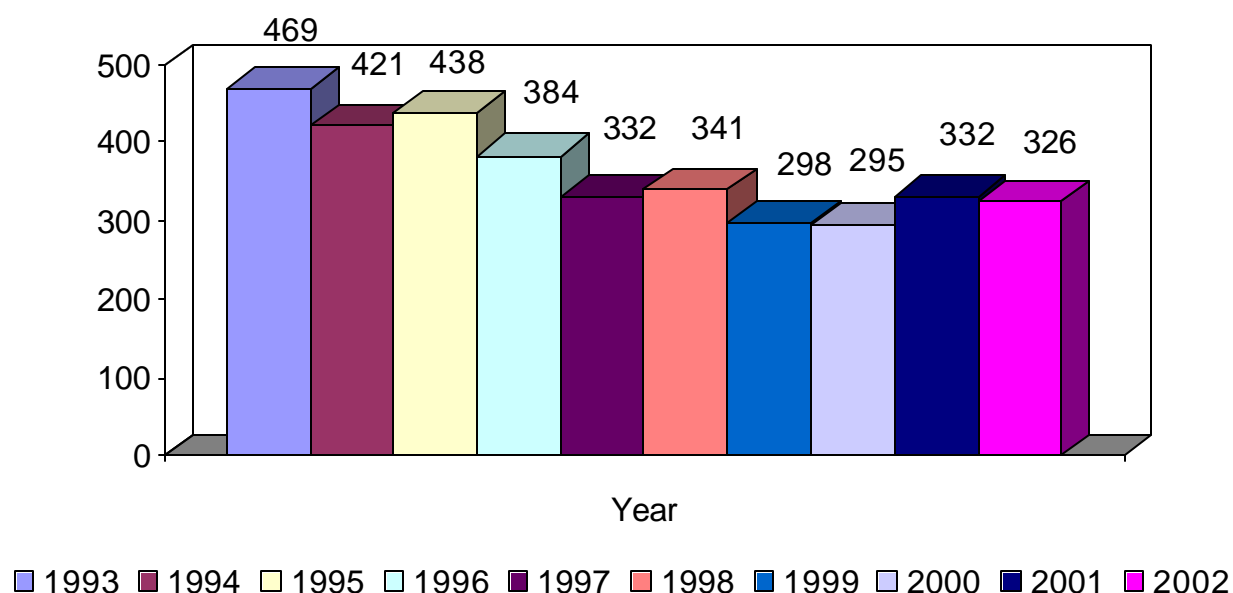


Figure 1: TB Cases in San Diego County, 1993-2002

* case rates are per 100,000 persons
unless otherwise stated

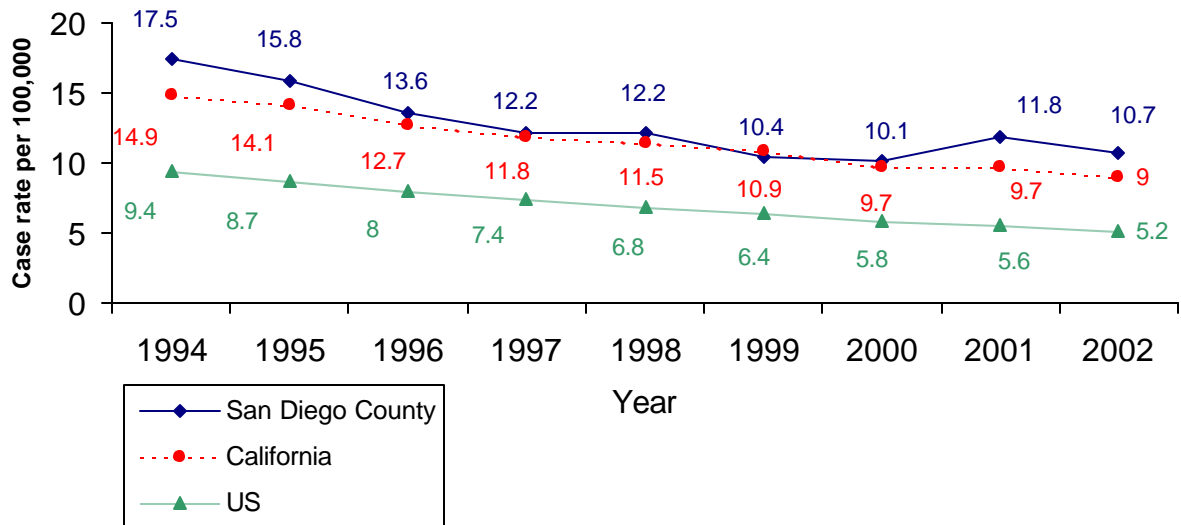


Figure 2: TB Case Rates in San Diego County, California, and the US, 1994-2002

Reporting of Cases

In 2002 most cases were reported by community providers (physicians, physician assistants, nurses, infection control staff) (Figure 3). The next largest number of TB cases was reported by laboratories followed by TB Control staff.

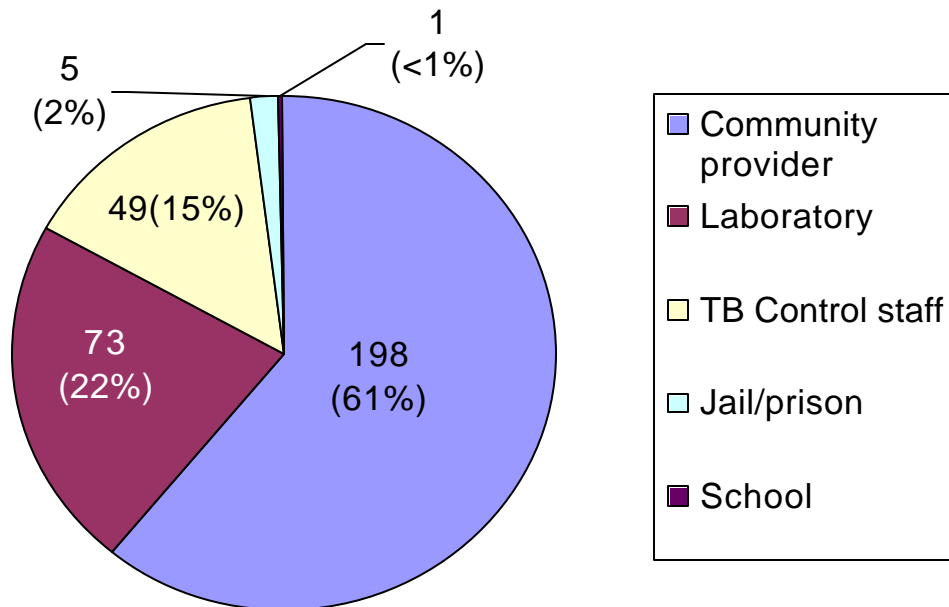


Figure 3: Distribution of Reporting Entities for TB Cases in San Diego County, 2002

Age

Children ages 0 to 4 accounted for 3% of cases in 2002 (Figure 4). There were 10 cases in this age group, a 74% decrease from 1993 (39 cases). US-born, Hispanic children comprised 100% of cases in the 0-4 age group in 2002. TB cases in young children are particularly important because they indicate recent transmission of disease. The median age of TB cases was 41 and ranged from 0 to 96 years of age. Persons aged 25 to 44 made up the largest group of TB cases, with 130 (40%). However, as a proportion of the population at risk, the 65 and older age group (62 cases) had the highest case rate (18.2). Between 2001 and 2002, TB cases in San Diego County decreased or were unchanged in each age group except for the 25 to 44 and 65+ age groups (Figure 5). There was an increase of 28 cases (27%) in the 25 to 44 age group. The largest decrease was seen in the 5 to 14 age group (12, 75%).

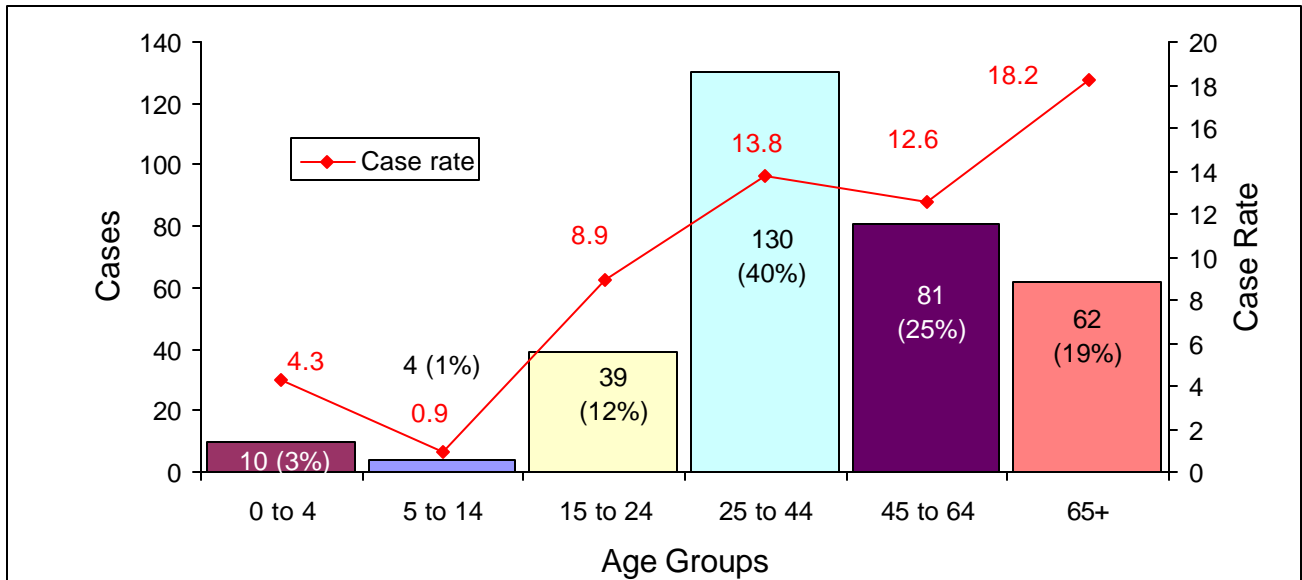


Figure 4: Case Distribution and Rates by Age in San Diego County, 2002

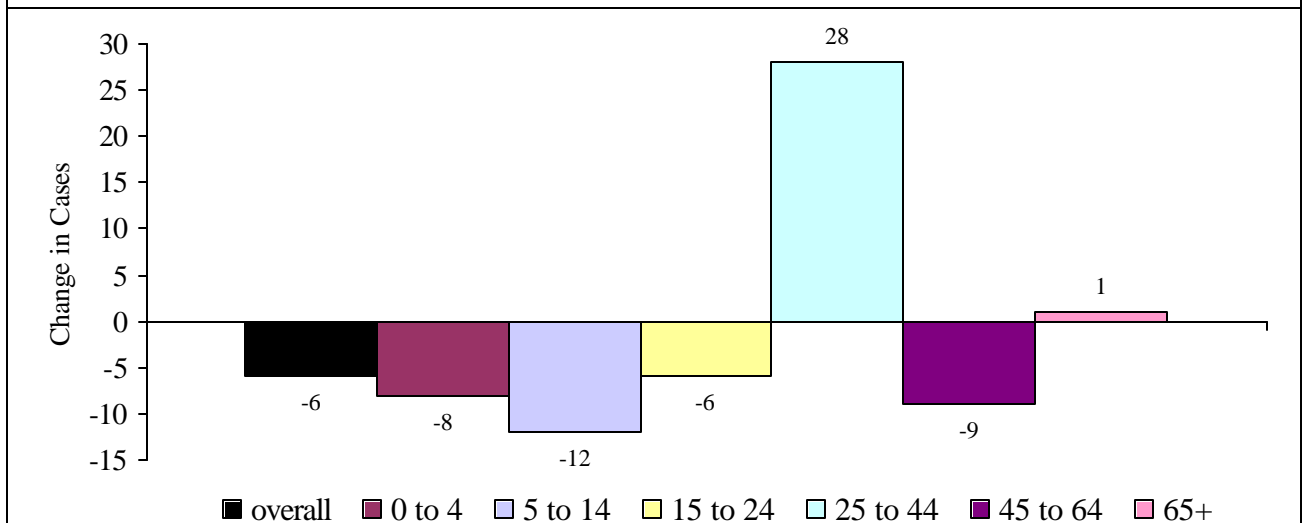


Figure 5: Change in TB Cases by Age Group, San Diego County 2001 to 2002

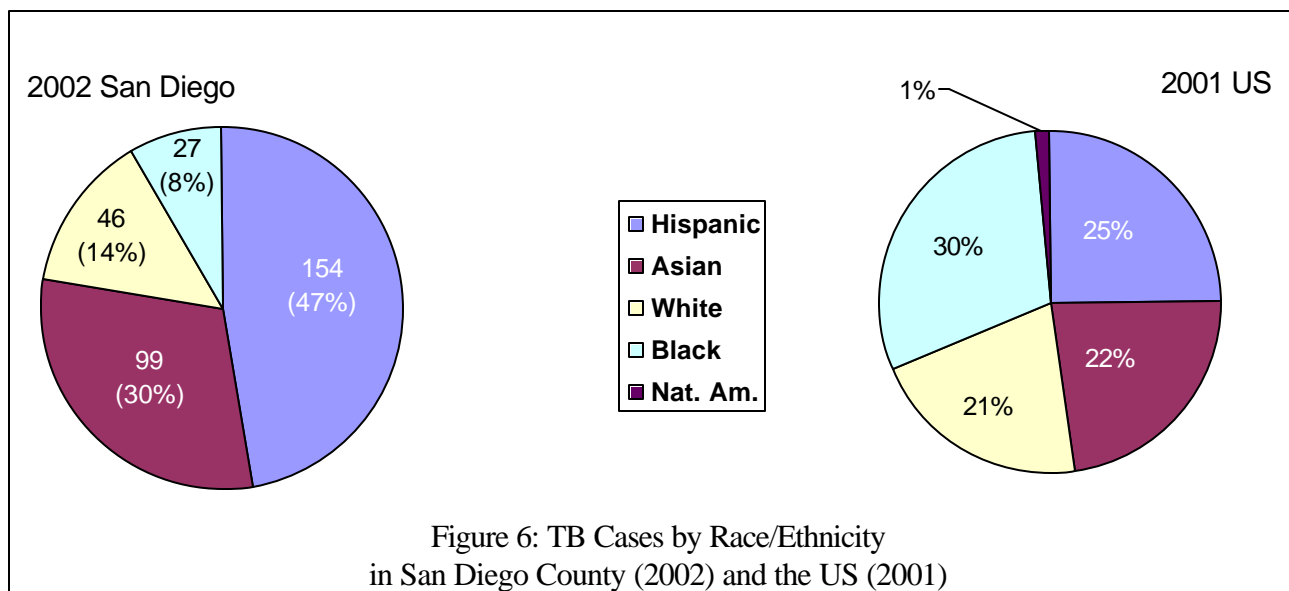
Race and Ethnicity

The distribution of TB cases in San Diego County by race/ethnicity in 2002 was 47% Hispanic, 30% Asian, 14% White, and 8% Black (Figure 6). The highest case rate (32.9) was found among Asians, followed by Hispanics (19.7), Blacks (15.1), and Whites (2.6).

For California (2001 data), the largest percentage of TB cases was found among Asians (42%), followed by Hispanics (38%), Whites (11%), Blacks (9%), and Native Americans (<1%). For the US (2001 data), the distribution of TB by race/ethnicity was 30% Black, 25% Hispanic, 21% White, 22% Asian, and 1% Native American. (Complete demographic data for 2002 TB cases for California and the US are not yet available.)

Case rates by race/ethnicity are shown in Figure 7. For San Diego County (32.9), California (33.8), and the US (32.7), Asians had the highest case rate. Whites had the lowest case rate for California (2.1) and the US (1.6) and the second lowest case rate for San Diego County (2.6). For San Diego County, the lowest case rate occurred in Native Americans (< 1.0). The Healthy People 2010 goal for the overall US case rate is 1.0 (red line in Figure 7). As can be seen from the graph, only Whites are currently approaching this target.

San Diego case rates among Hispanics are significantly higher than those seen in California or the US, likely reflecting the effect of San Diego's border location. Compared with California (2001 data), San Diego (2002 data) has a higher percentage of foreign-born Hispanic cases (32% versus 29%) and Mexican-born cases (29% versus 24%).



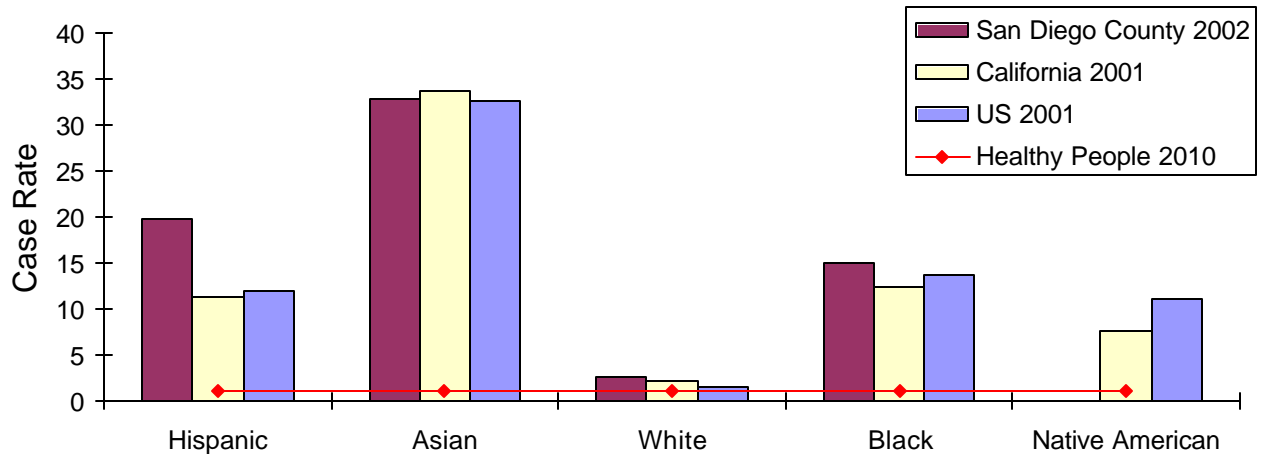


Figure 7: TB Case Rates by Ethnicity in San Diego County (2002), California (2001), and the US (2001) Compared to Healthy People 2010 Goal

From 2001 to 2002, the largest case increase in TB cases in San Diego County occurred in Blacks (7, 35%), and the largest drop among Hispanics (Figure 8). A stratified analysis of changes in cases in Blacks from 2001 to 2002 revealed the following: a 7 case increase in Black males, a 1 case increase in US-born Blacks, a 6 case increase in foreign-born Blacks (all from Africa), a 7 case increase in Blacks using excess alcohol or illicit drugs (all US-born), and a 4 cases increase among homeless Blacks (all US-born). The number of TB cases in HIV-seropositive Blacks was unchanged (4 in both years). For the 14 foreign-born Black TB cases in 2002, the distribution by country of birth was Somalia 10 cases, Ethiopia 3 cases and Kenya 1 case.

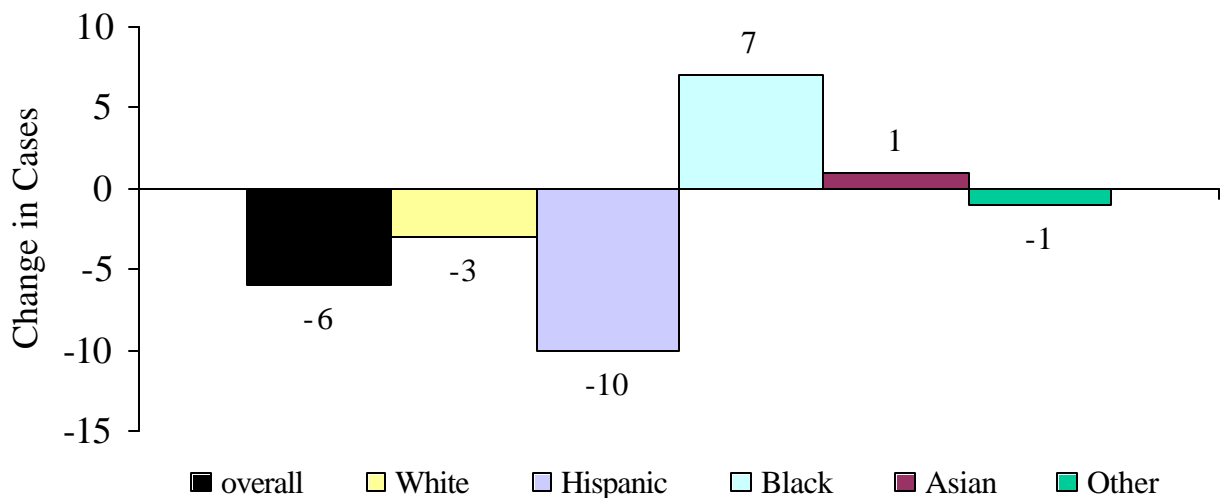


Figure 8: Change in TB Cases by Race/Ethnicity, San Diego County 2001 to 2002

Number of TB Cases in U.S.-born vs. Foreign-born Persons United States, 1991-2002

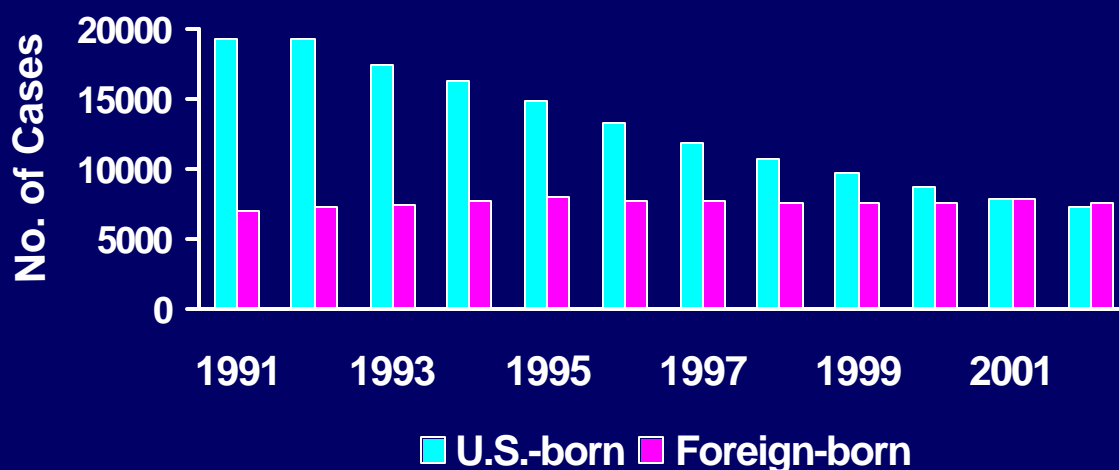


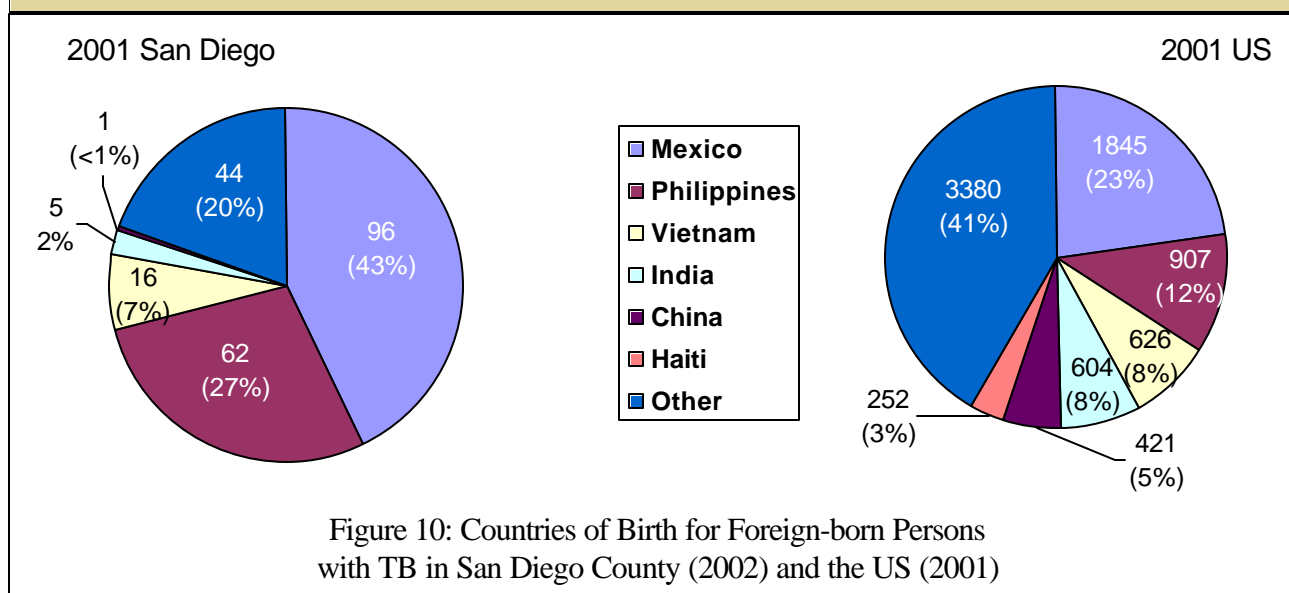
Figure 9

Country of Birth

A notable trend in TB epidemiology in the US has been the increase in the proportion of cases occurring in persons of foreign birth. Between 1992 and 2002, the percentage of TB cases in the foreign born increased from 27% to 51% (Figure 9). The number of cases in foreign-born persons has remained approximately 7,500 per year. During the same time period, cases among US-born individuals decreased from more than 19,000 in 1992 to fewer than 7,300 in 2002.

The most common countries of origin for persons of foreign birth with TB in the US in 2001 were Mexico (23%), the Philippines (12%), and Vietnam (8%) (Figure 10).

In San Diego County, foreign-born persons have consistently accounted for greater than 65% of TB cases (Table 1). In 2002, foreign-born persons comprised 69% of cases in San Diego County. The most common countries of origin for foreign-born TB cases in San Diego County in 2002 were Mexico (43%), the Philippines (27%), and Vietnam (7%) (Figure 10 and Table 1).



Recent studies of TB epidemiology in the foreign-born have shown that the majority of cases occur in immigrants who have been in the US for more than five years. The median time between arrival in the US and diagnosis of TB was 8.4 years for year 2002 foreign-born TB cases in San Diego County. The median varied by country of birth (Figure 11). In San Diego in 2002, 61 (25%) foreign-born TB cases were diagnosed within one year of entry into the US and 120 (54%) were diagnosed 10 or more years after arrival. Of the 61 foreign-born cases diagnosed in the first year, 16 (26%) were seen as part of a

Country of Origin	1997	1998	1999	2000	2001	2002
The Americas	192	224	190	179	222	203
United States	112	113	97	72	104	102
Mexico	76	106	87	103	115	96
Other	4	5	7	4	3	5
Asia	126	105	94	96	96	105
Vietnam	17	14	18	21	18	16
Philippines	78	67	62	62	55	62
Other	31	24	14	13	23	27
Europe	3	4	4	2	6	3
Africa	7	6	8	14	7	15
Other/Unknown	4	2	1	4	1	0
Total	332	341	298	295	332	326
% Foreign-born	66	67	67	76	69	69

Table 1: TB Cases in San Diego County by Country of Origin, 1997-2002

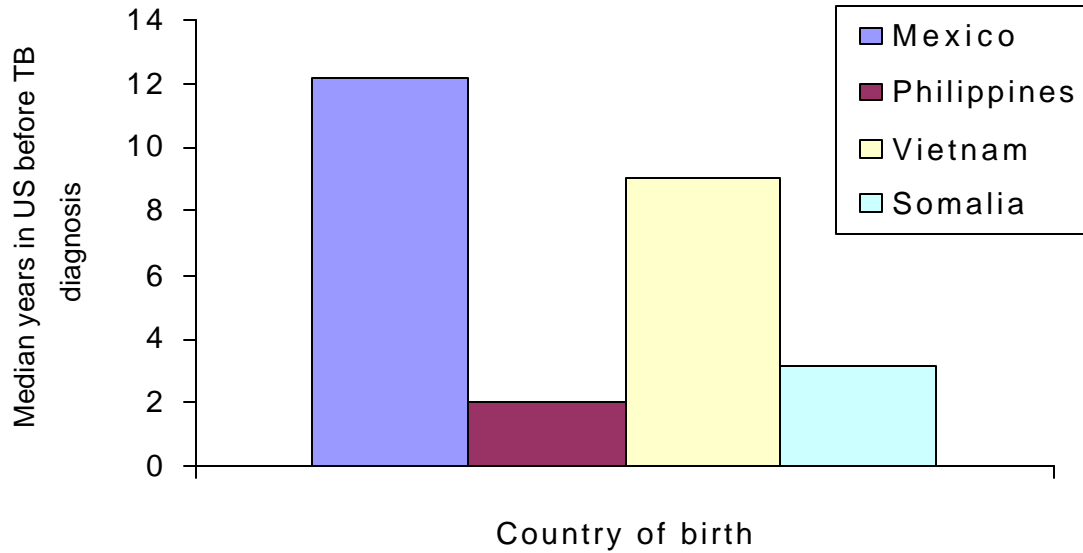


Figure 11: Median Years in US Before TB Diagnosis, Distribution by Country of Birth, 2002

health screening required for all entering immigrants and refugees. Fifteen of these immigrants were classified as B1 waivers and one was classified as an A waiver. The estimated TB case rate for San Diego County 2002 foreign-born residents was 34.3, compared with 4.3 for US-born residents.

From 2001 to 2002, TB cases in San Diego County in US-born persons decreased by 2 (2%) and TB cases in foreign-born persons decreased by 4 (2%) (Figure 12). Among foreign-born cases, the most significant decrease was noted in persons born in Mexico (19, 17%). Cases among persons born in the Philippines and African countries increased.

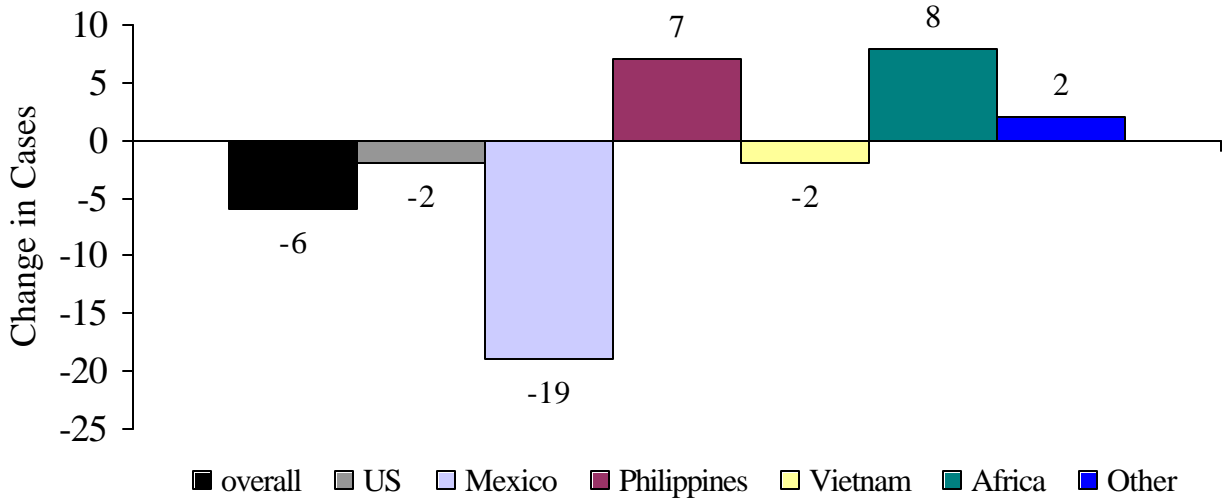


Figure 12: Change in TB Cases by Country of Birth, San Diego County 2001 to 2002

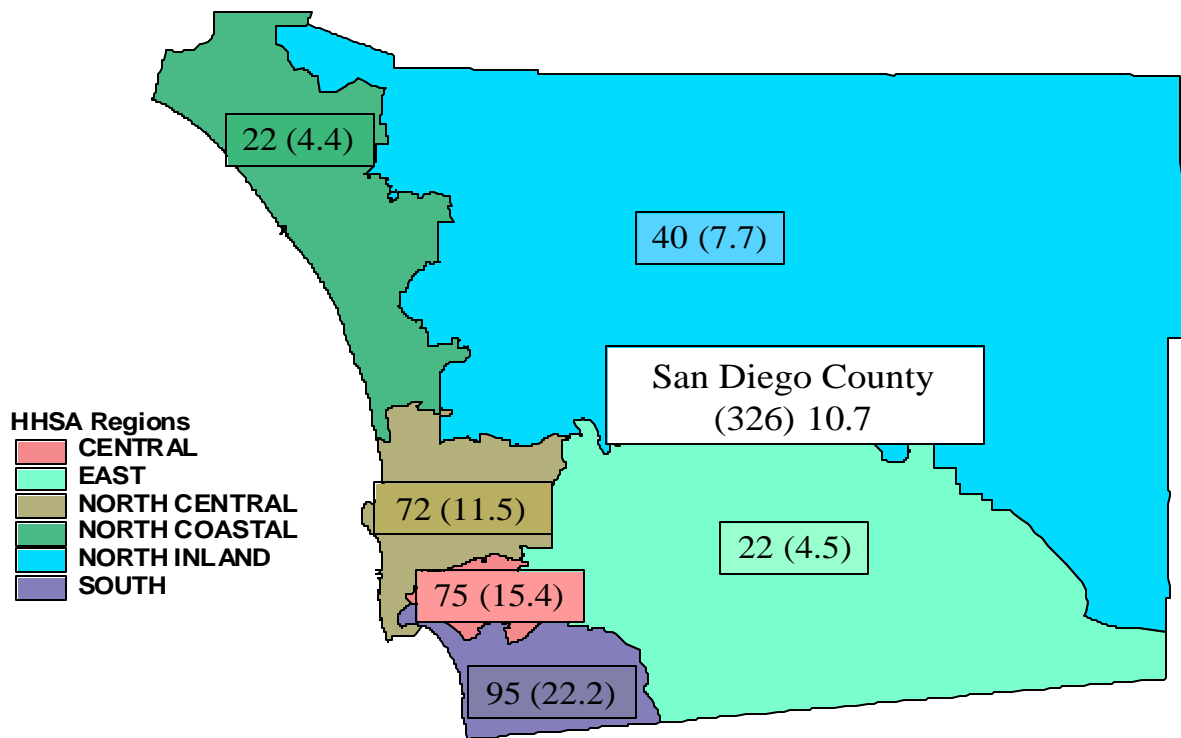


Figure 13: San Diego County TB Cases by Region, 2001
(case rates per 100,000 are shown in parentheses)

Geographic Distribution

San Diego County encompasses approximately 4,000 square miles. The distribution of 2002 TB cases in San Diego County by health region is shown in Figure 13. The largest number of cases occurred in the South Region (95) which also had the highest case rate (22.2). Case rates by zip code are demonstrated in Figures 14 and 15. Zip codes with case rates above that of San Diego County as a whole, and especially zip codes with case rates above 15, were concentrated in the Central and South Regions.

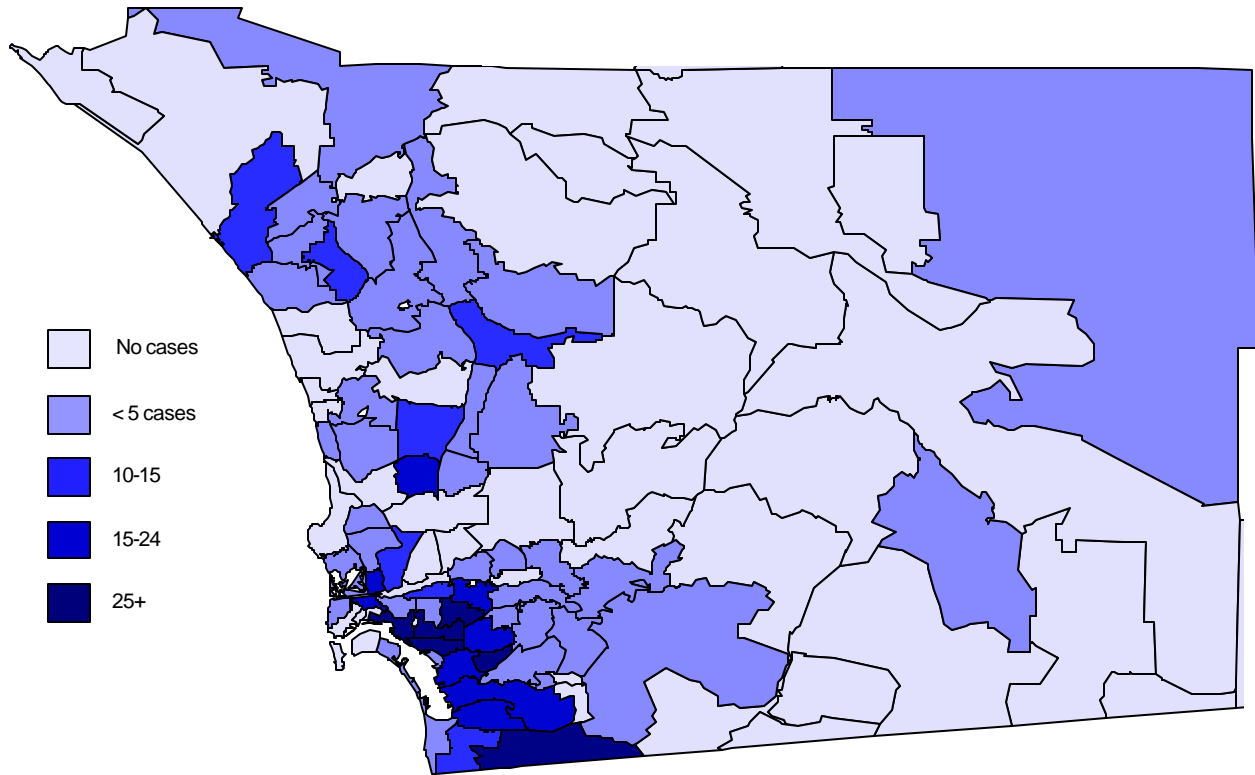


Figure 14: TB Case Rates by Zip Code for San Diego County, 2002

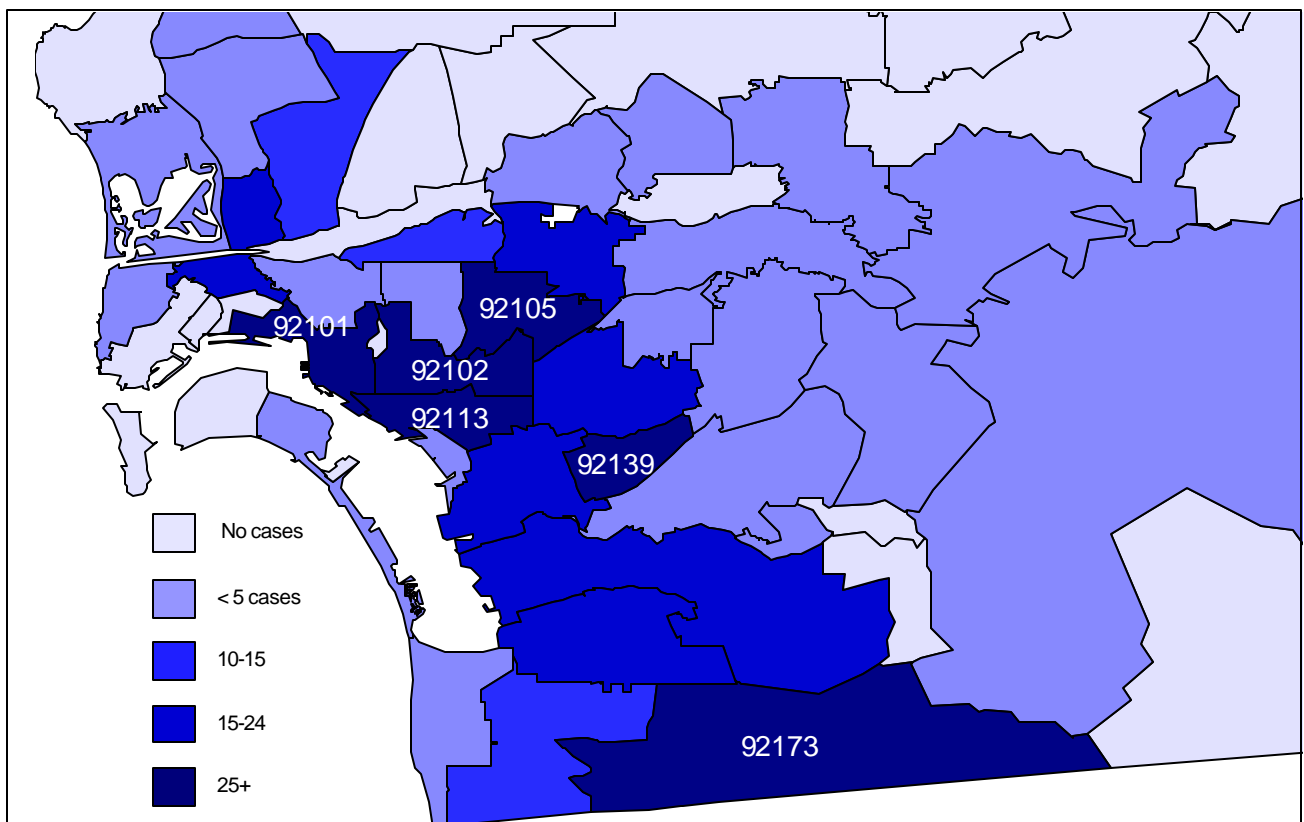


Figure 15: TB Case Rates by Zip Code, Zoom-in of Central and South Regions, 2002

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City	Cases	Rate	City	Cases	Rate
San Diego	208	15.7	Lemon Grove	4	(--)
Chula Vista	29	15.4	La Mesa	3	(--)
Oceanside	14	8.2	Carlsbad	3	(--)
Escondido	13	9.9	Imperial Beach	3	(--)
National City	12	21.2	Fallbrook	2	(--)
Vista	9	10.0	Coronado	2	(--)
Spring Valley	6	7.1	San Marcos	2	(--)
El Cajon	5	5.1	7 others	1 each	(--)
Poway	4	(--)*			

* case rates not calculated for cities with < 5 cases

Table 2: San Diego County TB Cases and Case Rates (per 100,000) by City, 2002

Cases distributed by city are shown in Table 2. The city of San Diego had 208 cases (64% of total) with a case rate of 15.7. The cities with the highest case rates were National City (21.2), San Diego (15.7) and Chula Vista (15.4).

From 2001 to 2002, the largest decrease in TB cases in San Diego County occurred in the North Central Region (18, 20%) (Figure 16). The largest increase was noted in the North Coastal Region (5, 29%). The North Inland, Central and East Regions experienced small increases, and the South

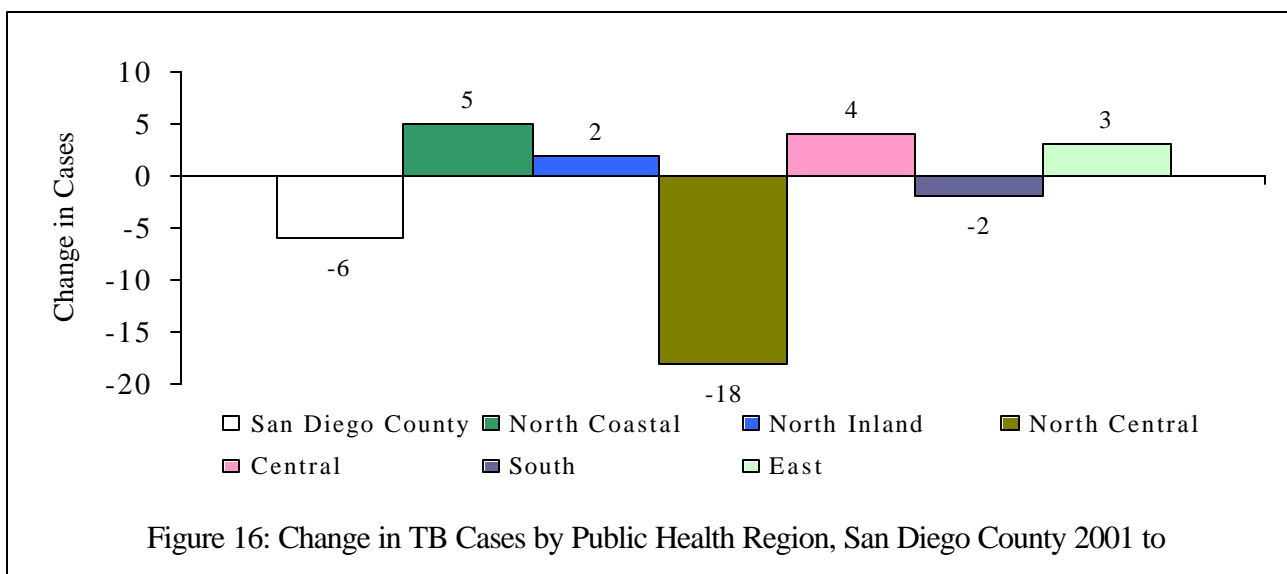


Figure 16: Change in TB Cases by Public Health Region, San Diego County 2001 to

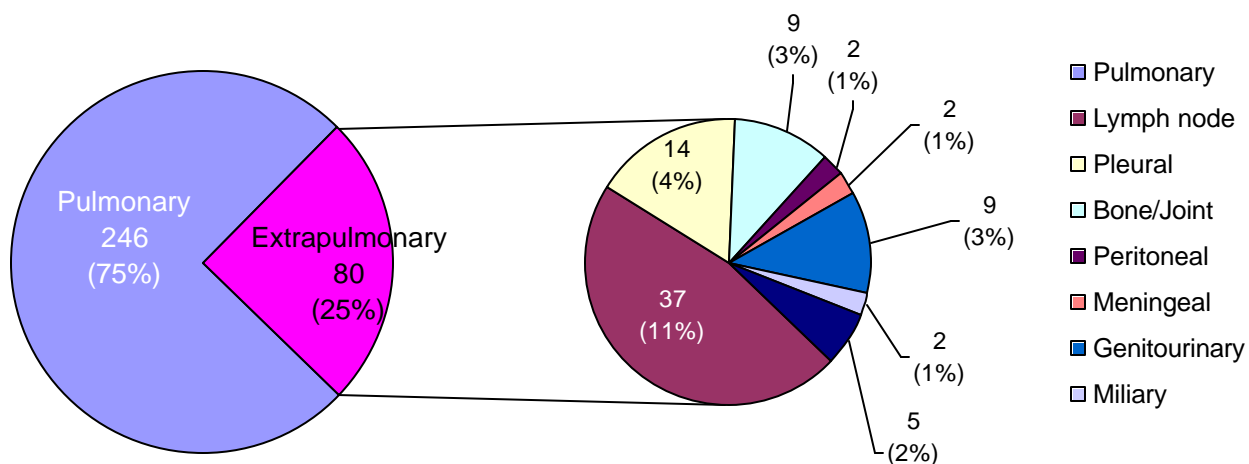


Figure 17: San Diego County TB Cases by Body Site of Disease, 2002

region had a small increase.

Body Site of Disease

The distribution of 2002 TB cases by primary site of disease is shown in Figure 17. The majority of cases were pulmonary (lung) (75%). The percentage of cases of pulmonary TB has remained fairly constant (73-81%) since 1994. Of patients with pulmonary disease as the primary site, 4% also had disease at an extrapulmonary site. Fifty-seven percent of patients with pulmonary TB had at least one positive sputum acid-fast bacillus (AFB) smear (indicative of a increased probability of infectiousness). TB of the lymph

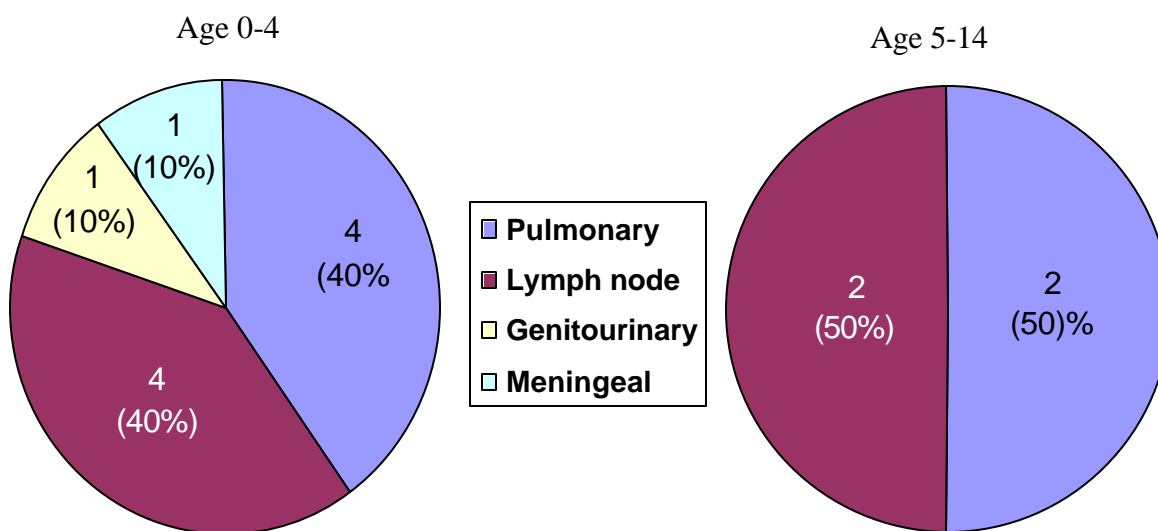


Figure 18: Body Site of Disease for TB Cases Ages 0-4 and 5-14, 2002

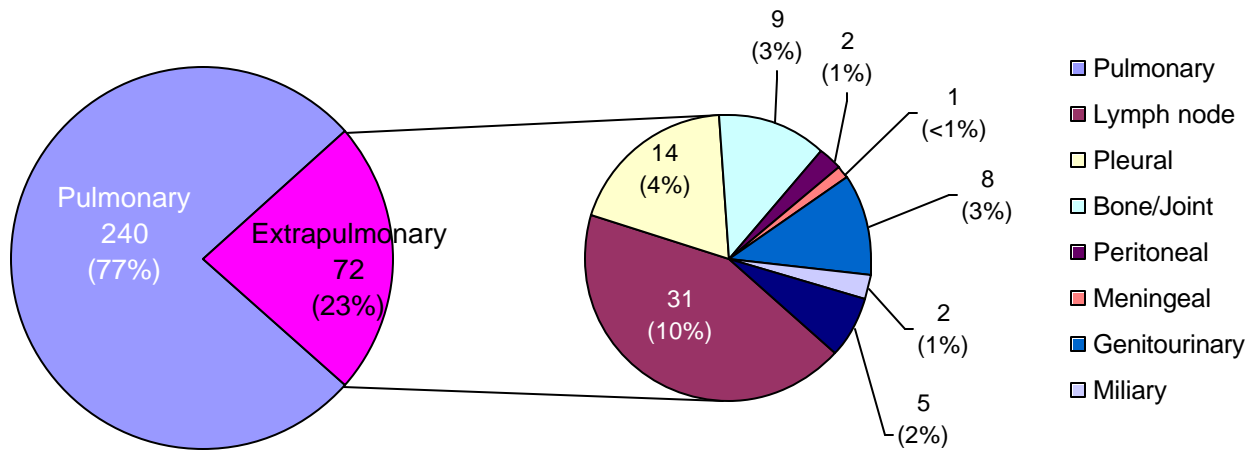


Figure 19: Body Site of Disease for TB Cases Ages 15 and Greater, 2002

nodes was the second most common site of disease in 2002 (11%), a figure which has also shown little variation (9-11%) since 1995. Distribution of body site of disease varied by age with children being more likely to have extrapulmonary disease (Figures 18 and 19).

HIV Co-infection

Individuals co-infected with HIV are more susceptible to acquiring TB infection and progressing to active disease. While the lifetime risk for progression from infection to disease is under 10% for immunocompetent persons, the risk for progression in the HIV infected is approximately 8% per year. Active TB is more likely to disseminate to organs outside the lung in HIV patients, and they are at increased risk for significant morbidity and mortality.

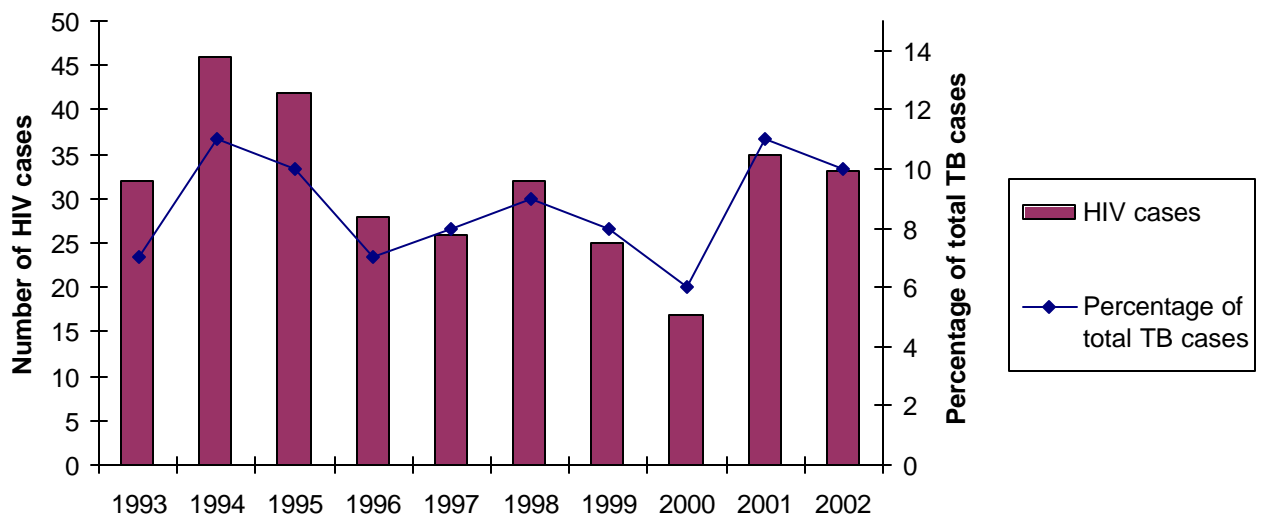


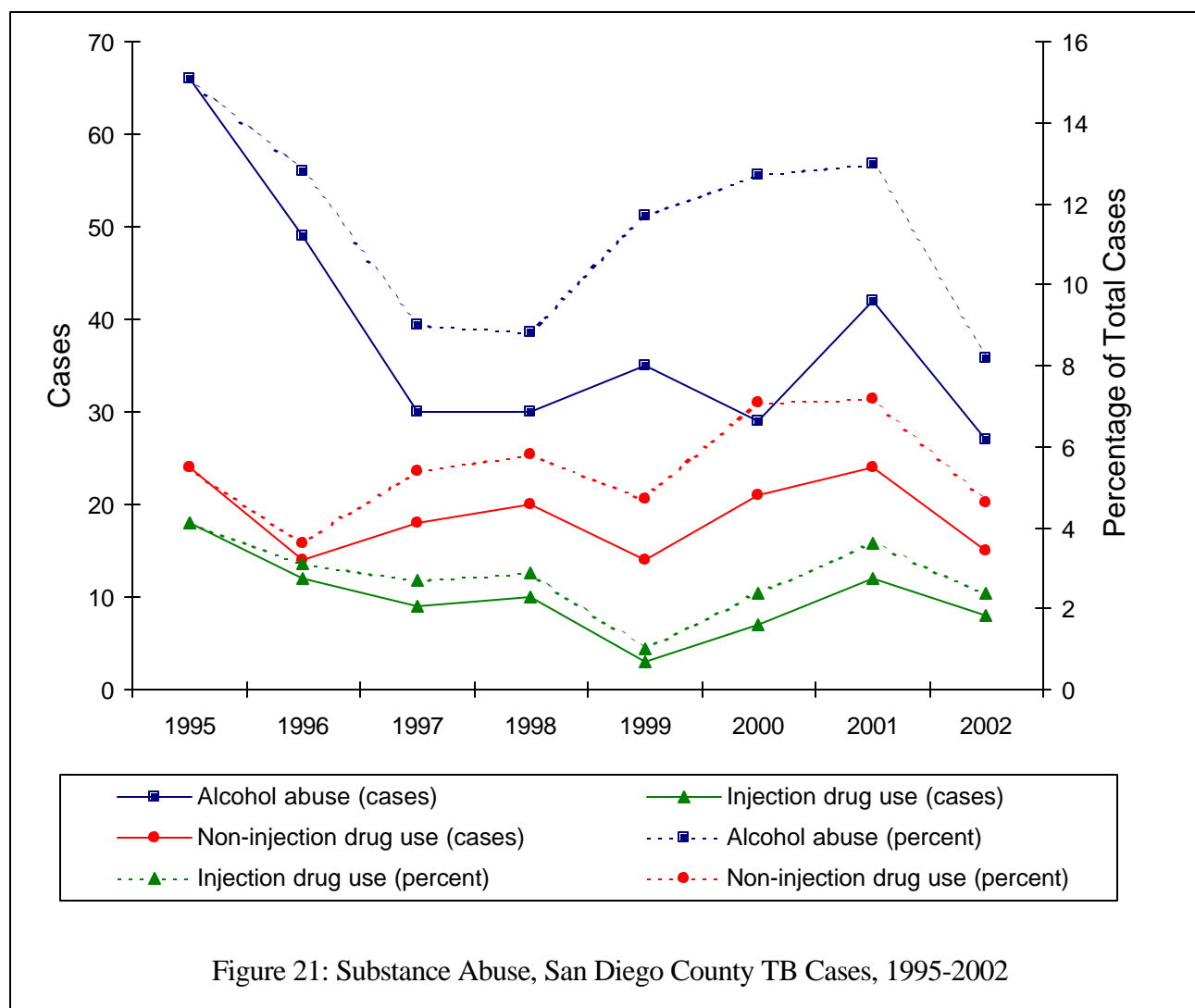
Figure 20: HIV Cases as a Proportion of All TB Cases in San Diego County, 1995-2002.

In 2002 in San Diego County, 33 patients with TB were co-infected with HIV, about 10% of total TB cases (Figure 20). The peak number of HIV-TB cases occurred in 1994 (46). The percentage of total cases has remained fairly steady over the past decade ranging from 6% to 11%. From 2001 to 2002, the number of HIV infected cases decreased from 35 to 33 (6%). Thirty-four percent (compared to 20% of non-HIV cases) of TB/HIV cases had disease at an extrapulmonary site with or without pulmonary TB (19% had extrapulmonary disease only).

In 2002, most TB/HIV cases occurred in males (88%). Hispanics (67%) and Whites (21%) and people in the 25 to 44 (73%) and 45 to 64 (27%) age groups comprised the majority of cases by race/ethnicity and age, respectively. Nineteen (58%) TB/HIV cases were born outside of the US; 17 of the 19 (89%) were born in Mexico.

Other High Risk Groups: Homelessness, Substance Abuse, Incarceration

A number of other conditions are associated with an increased risk for TB infection and disease. Among these are homelessness, substance abuse, and incarceration in jail or prison. In 2002, 56 (17%) TB patients had at least one of these risk factors, and 19 (6%) had multiple risk factors. Of 326 patients with



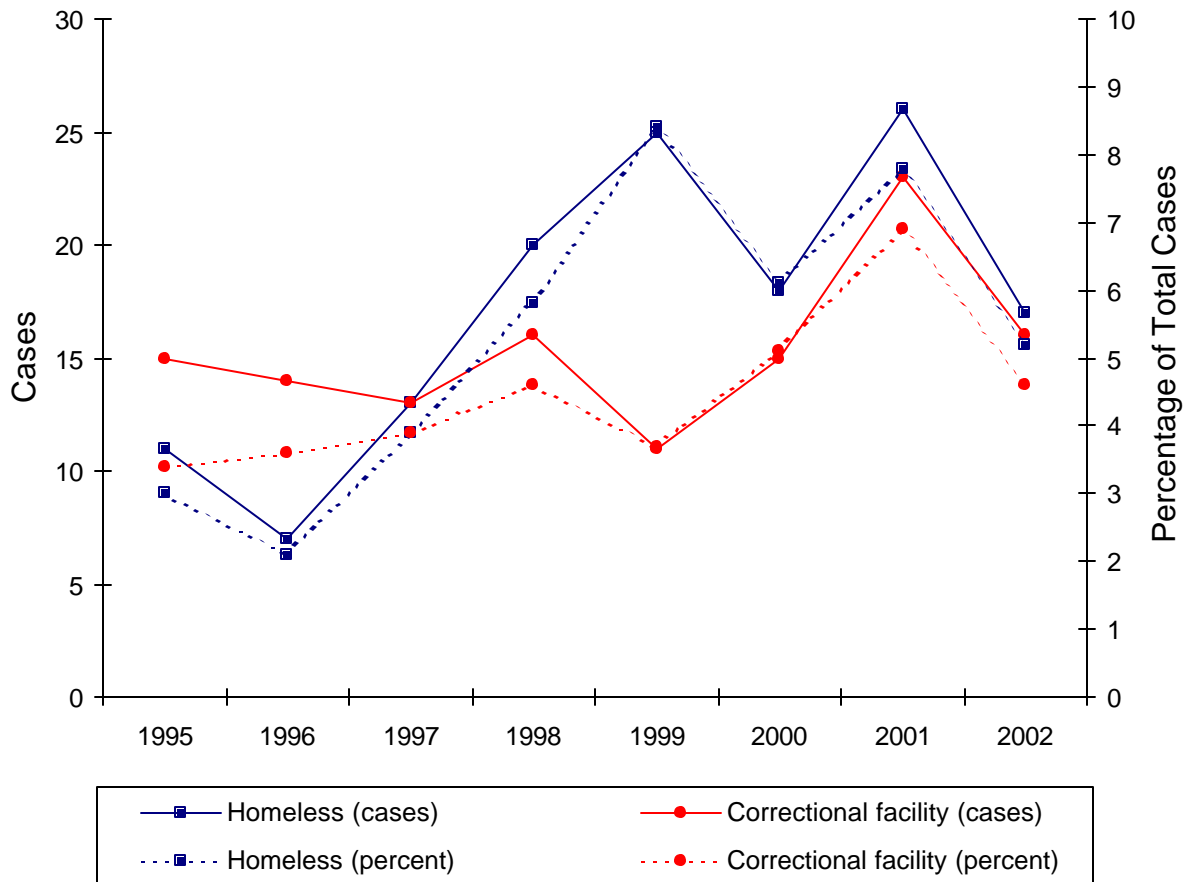


Figure 22: Homelessness and Incarceration, San Diego County TB Cases, 1995-2002

TB in 2002, 17 (5%) were homeless, 27 (8%) abused alcohol, 8 (2%) injected drugs, 15 (5%) used non-injected drugs, and 16 (5%) were diagnosed while in a correctional facility (county jail: 8, state prison: 0, federal prison: 2, other: 6). Figure 21 shows the absolute number and percentage of total TB cases noted to abuse alcohol, injection, and non-injection drugs for the years 1995-2002. Figure 22 shows the absolute number of TB cases and the percentage of TB cases that were homeless or diagnosed while in a correctional facility for the years 1995-2002.

Drug Resistant TB

TB may become resistant to medications if treatment is inadequate because of patient nonadherence or medical provider error. Resistant

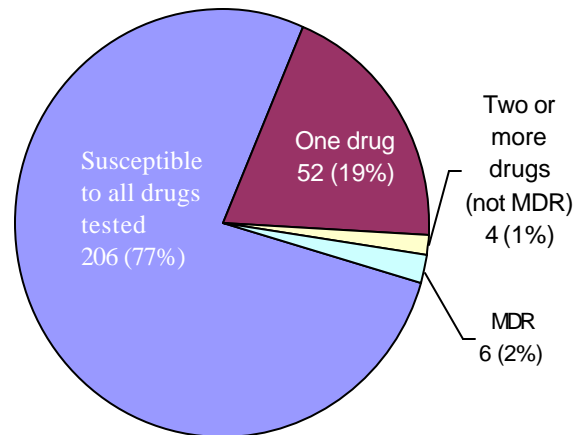


Figure 23: First-Line Drug Resistance San Diego County TB Cases, 2002

TB is more difficult to treat successfully, especially multi drug-resistant (MDR) TB, defined as TB resistant to both isoniazid (INH) and rifampin. MDR TB has a lower cure rate and a higher mortality rate.

In 2002, drug susceptibility results were obtained for 268 (82%) TB cases. Of the remaining 58 cases, 56 did not have cultures obtained or all cultures were negative. For adults (age > 14) positive cultures were obtained in 264 of 312 (85%) patients, but in children (ages 0 to 14) positive cultures were obtained in only six of 14 (43%) of patients. Two patients had positive cultures, but drug susceptibility results were not available to the TB program. Of 268 TB cases with known susceptibility results, 52 (19%) were resistant to one first-line* drug, four (1%) were resistant to two or more first-line drugs (not MDR) and six (2%) were MDR (Figure 23). Five (83%) of six patients with MDR TB and 23 (92%) of 25 patients with INH resistant TB, respectively, did not have a history of TB treatment prior to their current episode (Table 3) indicating that they were originally infected with these resistant strains. Four (67%) of six patients with MDR TB and 21 (84%) of 25 patients with INH resistant TB, respectively, were born outside of the US. Of the 41 MDR-TB cases in San Diego from 1993-2002, 34 (83%) were born outside the US. Twenty-two of 33 patients with pyrazinamide (PZA) resistant TB were infected with *Mycobacterium bovis* (described in subsequent section), one was infected with *Mycobacterium tuberculosis*, and 10 patients did not have species identification testing performed on their cultures (identified as *Mycobacterium tuberculosis* complex only).

In terms of individual medications, 31 (12%) cases were resistant to INH (17 resistant INH alone, six MDR, four resistant to INH and streptomycin, one resistant to INH and ethambutol, three resistant to INH and PZA), 33 (12%) were resistant to PZA (29 resistant to PZA alone, one MDR and PZA, three resistant to INH and PZA), eight (3%) were resistant to rifampin (two resistant to rifampin alone, six MDR), four (1%) were resistant to ethambutol (three MDR and ethambutol, one resistant to INH and ethambutol) and 13 (5%) were resistant to streptomycin (eight resistant to streptomycin alone, one MDR and streptomycin, four resistant to INH and streptomycin) (Figure 24). The 2002 INH resistance rate of 12% is consistent with that found during the preceding 8 years (usually 10-12%). Because INH resistance exceeds the recommended threshold of 4%, all TB suspects and cases in San Diego County should be started on four drug chemotherapy (usually INH, rifampin, ethambutol, and PZA) while susceptibility results are pending.

In 2002, INH resistance varied by age group (Table 3). There were no INH-resistant TB cases in patients under 15 years of age, and there have been none in this age group since 1997. Eighty-eight percent of INH-resistant cases occurred in individuals over 25 years of age. Twenty-one of 25 (84%) TB cases with INH resistance were born outside of the US (seven Mexico, 14 Philippines) and 19 of 33 (58%) TB cases with PZA resistance were foreign-born (17 Mexico, one Philippines, one other).

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	Total Cases		INH resistant (excluding MDR)		INH and rifampin resistant (MDR)		Pyrazinamide resistant	
	No prior treatment	Prior TB treatment	No prior treatment	Prior TB treatment	No prior treatment	Prior TB treatment	No prior treatment	Prior TB treatment
Race								
White	44	2	0 (0)†	0 (0)	1 (2)	0 (0)	3 (7)	0 (0)
Black	25	2	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Asian	96	3	10 (10)	1 (33)	3 (3)	0 (0)	3 (3)	0 (0)
Hispanic	149	5	13 (9)	1 (20)	1 (1)	1 (20)	26 (17)	1 (20)
Country of birth								
US	98	4	4 (4)	0 (0)	2 (2)	0 (0)	14 (14)	0 (0)
Mexico	93	3	6 (6)	1 (33)	1 (1)	1 (33)	16 (17)	1 (33)
Philippines	59	3	13 (22)	1 (33)	2 (3)	0 (0)	1 (2)	0 (0)
Other countries	64	2	0 (0)	0 (0)	0 (0)	0 (0)	1 (2)	0 (0)
Age groups								
0-4	10	0	0 (0)	0 (0)	0 (0)	0 (0)	3 (30)	0 (0)
5-14	4	0	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
15-24	39	0	2 (5)	0 (0)	0 (0)	0 (0)	3 (8)	0 (0)
25-44	125	5	7 (6)	1 (20)	2 (2)	1 (20)	14 (11)	1 (20)
45-64	78	3	11 (14)	0 (0)	1 (1)	0 (0)	6 (8)	0 (0)
65+	58	4	3 (5)	1 (25)	2 (3)	0 (0)	6 (10)	0 (0)

**Table 3: Drug Resistance - Race, Country of Birth, and Age
San Diego County TB Cases, 2002**

† numbers in parentheses are percentages of total for that group

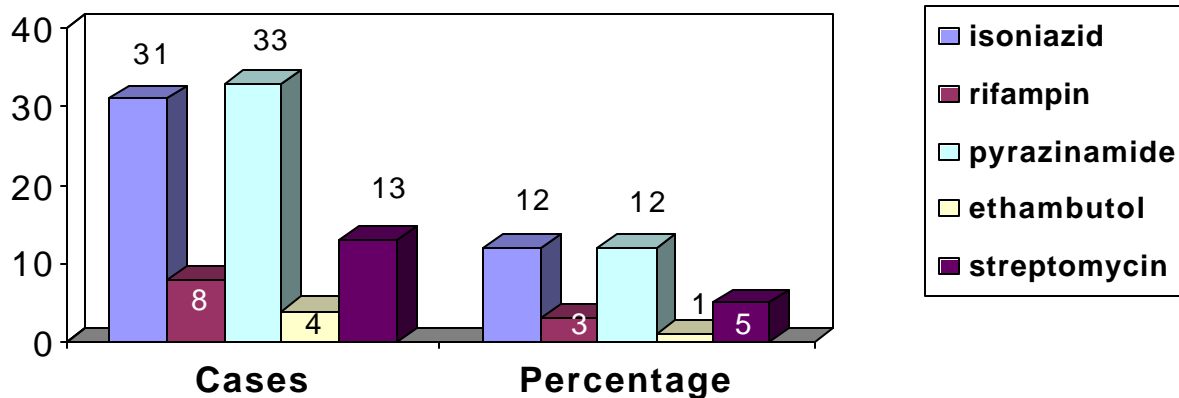
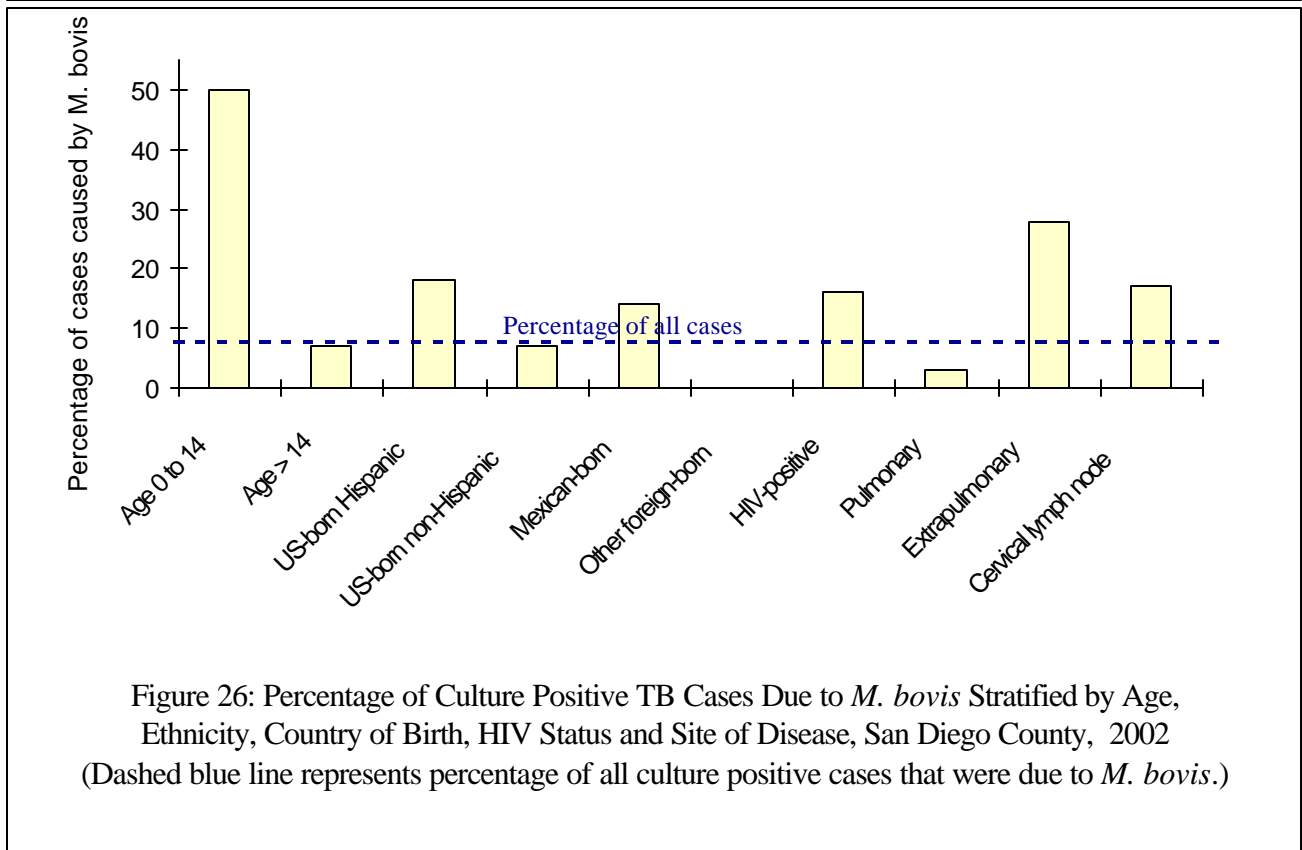
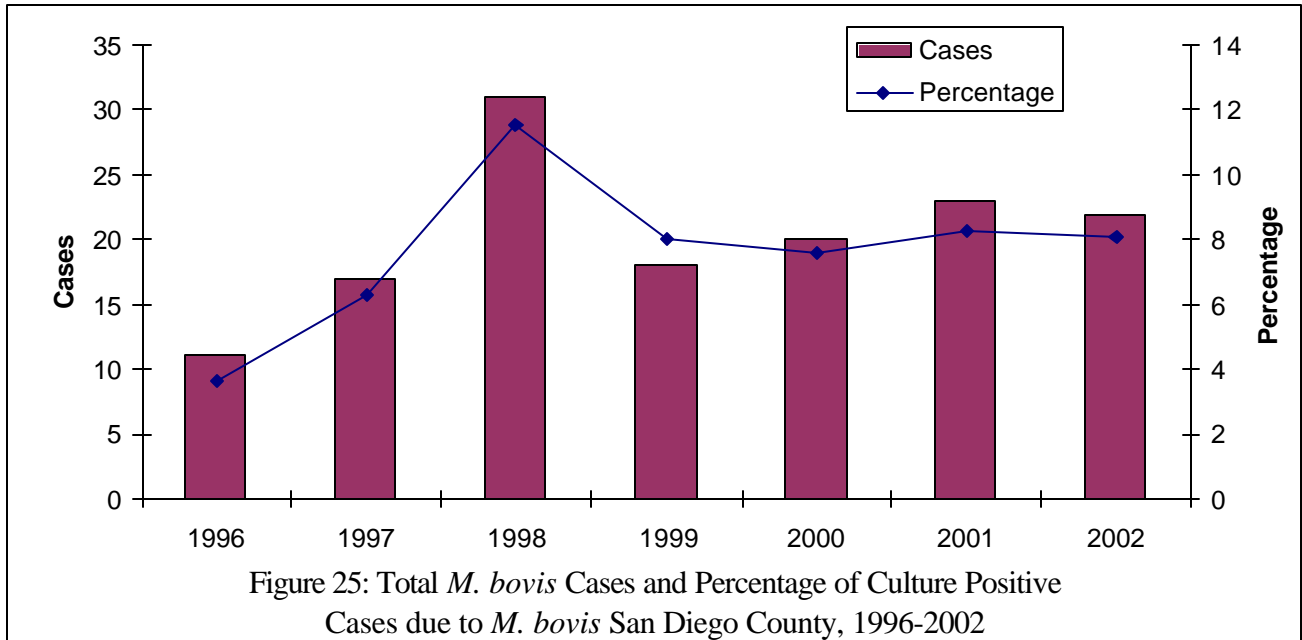


Figure 24: Resistance to Individual Medications in San Diego County TB Cases, 2002

Disease Due to *Mycobacterium bovis*

Disease due to *Mycobacterium bovis*, also known as bovine tuberculosis, is usually contracted through the consumption of unpasteurized dairy products. Person-to-person transmission via inhalation of aerosolized organisms (the method through which *M. tuberculosis* is spread - see "Evaluation of Close Contacts to TB Cases") is also believed to occur. In San Diego, because five to 10 percent of TB cases are due to *M. bovis*, strategies to address both modes of transmission are important to overall TB control efforts.



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	1997	1998	1999	2000	2001	Total
Started Treatment*	311	334	292	290†	325†	1552†
Completed (<= 12 mos.)	225	250	233	196	222	1126
Completed (>12 mos.)	43	36	27	36	22	164
Still on Treatment	0	0	0	4	16	20
Moved	19	17	10	13	26	85
Died	21	22	16	25	23	107
Lost	0	2	2	11	13	28
Refused	0	0	0	0	1	1
Other	3	7	3	5	2	20
Percent Completion	87%	86%	89%	81%	79%	84%
Percent Completion (Excluding Died and Moved)	99%	97%	98%	94%	94%	96%
Percent Completion within 12 Months	72%	75%	79%	68%	72%	73%
Percent Completion within 12 Months (Excluding Died and Moved)	83%	85%	88%	79%	86%	84%

* Excludes patients who died prior to the start of treatment.

†Completion rates exclude patients still on treatment.

Table 4: Treatment Outcomes for San Diego County TB Cases, 1997-2001

In 2002, 22 cases of *M. bovis* disease were reported in San Diego County (Figure 25). Since 1993, there have been 172 reported cases in the county. In 2002, 86% of *M. bovis* cases occurred in Hispanics either born in Mexico (63%) or the US (37%). Five patients (23%) with *M. bovis* disease were HIV-infected. Fifteen (68%) had disease at an extrapulmonary site. As can be seen in Figure 26, the following factors were associated with an increased likelihood of having *M. bovis* disease: age less than 15, US-born with Hispanic ethnicity, Mexican-born, HIV disease and extrapulmonary site of disease.

M. bovis is uniformly resistant to PZA and accounted for 67% of PZA-resistant cases in 2002. Since 1993, about 5% of *M. bovis* isolates have been resistant to INH. In 2001, two of 22 (9%) *M. bovis* cases were INH-resistant. Both cases occurred in adult Hispanics who had pulmonary disease.

Treatment Outcomes (1997-2001‡ Cohorts)

From 1997 through 2001, 1,552 patients with TB were started on treatment in San Diego County. Overall 84% of these patients completed treatment (Table 4) with 73% completing within 12 months.

‡ Much of the outcome data for the 2002 cohort is not yet available as many patients remain on treatment.

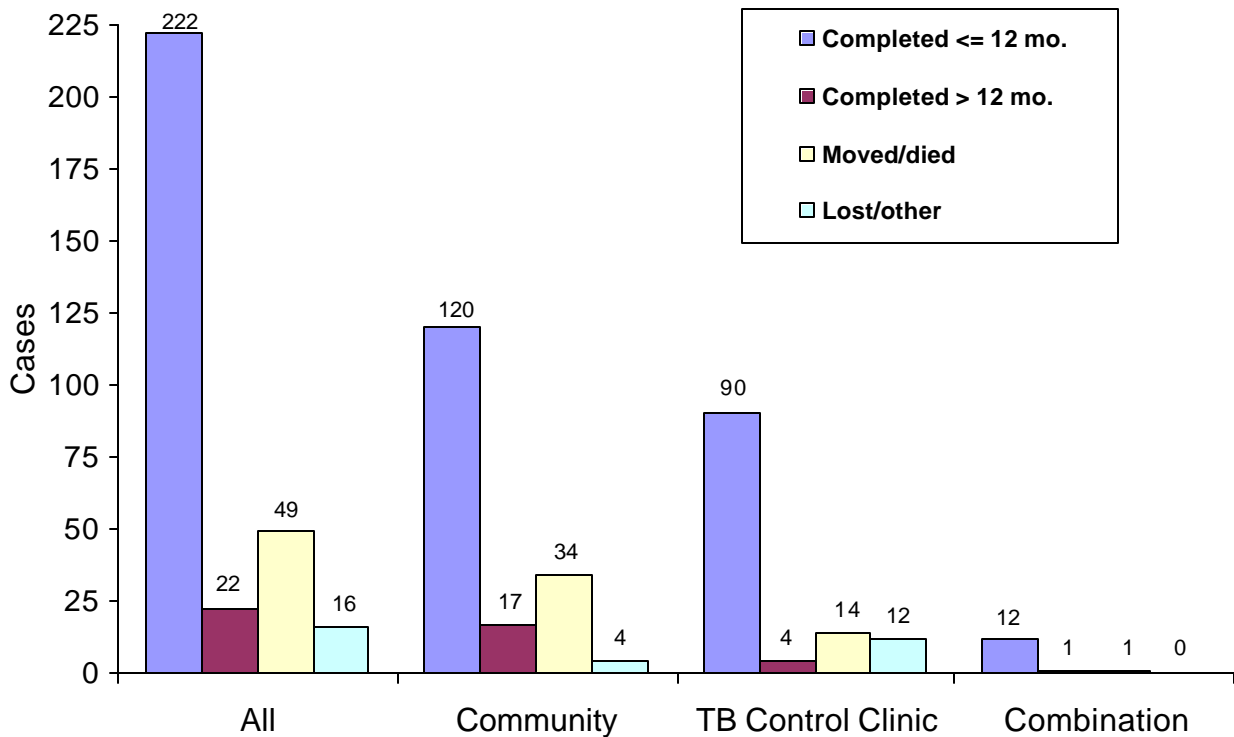


Figure 27: San Diego County TB Cases Outcomes by Medical Provider Type, 2001

When patients who died or moved were excluded, the overall and 12 month completion rates were 96% and 84%, respectively.

Treatment Outcomes for 2001 Cohort: Medical Provider Type

In San Diego County, most TB patients are treated, at least in part, by community providers. However, the TB Control Program provides case management, directly observed therapy and other assistance for all TB cases, regardless of medical provider type. For the 2001 cohort, 175 (57%) patients received treatment solely from community providers, 120 (39%) patients were treated at the TB Control Clinic, and 14 (5%) received treatment from a combination of both (Figure 27). Including patients who died or moved, treatment outcomes were the same (79% completion) for patients treated by the TB Control Clinic and those treated by community providers. This is an expected outcome based on the strong partnership between community providers and the TB Control Program. in addressing barriers to treatment completion throughout therapy.

Deaths during treatment were more common in patients being treated by community providers while patients treated at TB Control Clinic were more likely to be lost. The former is likely due to a higher frequency of comorbidities among patients being treated by community providers. For example, essentially all patients with HIV infection are eligible for some type of medical funding and receive their care from community providers who can treat both their TB and HIV. The TB Clinic, on the other hand, treats many recent immigrants. Some return to their original country or are deported and, for treatment outcome purposes, are considered lost.

Use of Directly Observed Therapy in 2001 TB Cases

To treat active tuberculosis, multiple medications must be given for at least six months. If therapy is interrupted or taken inappropriately, drug resistance may develop. In order to overcome the problem of patient nonadherence, a primary treatment strategy used worldwide is directly observed therapy (DOT). DOT entails the administration of medication under the direct observation of a nurse or outreach worker. Use of DOT has been demonstrated to increase TB cure rates and decrease acquired and primary drug resistance.

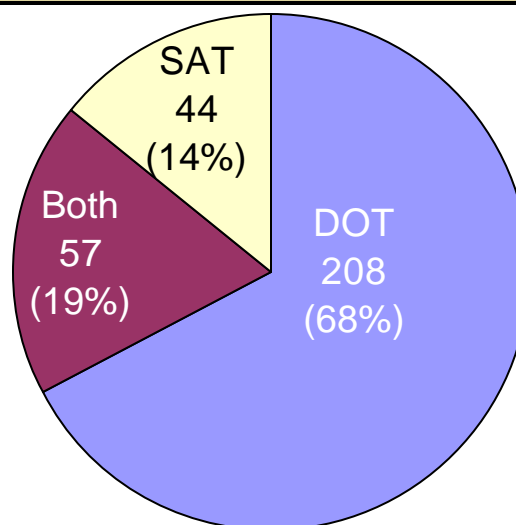


Figure 28: Use of DOT
San Diego County TB Cases, 2001

According to current national treatment guidelines (published in *Am J Respir Crit Care Med*, Vol 167, pp 603–662, 2003), “It is strongly recommended that patient-centered care be the initial management strategy, regardless of the source of supervision. This strategy should always include an adherence plan that emphasizes directly observed therapy (DOT), in which patients are observed to ingest each dose of antituberculosis medications to maximize the likelihood of completion of therapy. Programs utilizing DOT as the central element in a comprehensive, patient-centered approach to case management (enhanced DOT) have higher rates of treatment completion than less intensive strategies.” DOT is the best means of ensuring treatment for most patients and is used as an adjunct to other types of supportive care. Priority for DOT assistance is given to patients with drug resistance, suspected or documented nonadherence to treatment, unstable housing, ongoing substance abuse, severe immunosuppressive diseases or conditions, patients taking multiple medications for other conditions, and children.

In 2001, final information on the method of treatment, DOT versus self administered (SAT), was available for 309 of 325 TB cases started on therapy. Approximately 86% of these patients received some or all of their treatment as DOT (Figure 28).

	Number	Rate
Infectious pulmonary cases for investigation	128	
Number of contacts identified	834	6.5 contacts per case
Number of contacts evaluated for infection and disease	692	83%
Number of contacts with TB disease	11	2%
Number of contacts with latent TB infection	288	42%
Number of contacts who started LTBI treatment	176	61%
Number of contacts who completed LTBI treatment	78	44%
Table 5: Contact Investigation of Infectious Pulmonary TB Cases San Diego County, 2001		

Evaluation of Close Contacts to Infectious Pulmonary TB Cases (2001 Cohort)

TB is transmitted via infectious airborne particles produced by patients with pulmonary (lung) TB. Likelihood of transmission depends on six factors: 1) infectiousness of the TB case; 2) proximity of contact to the TB case; 3) duration of contact to the TB case; 4) host susceptibility; 5) the environment in which contact occurs (i.e. the risk increases with poor ventilation); and 6) virulence of the TB strain. When deciding whether an individual who has been in contact with a TB patient needs evaluation for TB infection, all of these factors are considered. Priority for contact investigation is given to highly infectious cases (e.g. pulmonary disease: AFB smear positive and/or cavitary disease and/or extensive infiltrates), highly susceptible contacts (e.g. children and immunosuppressed contacts), and contacts with prolonged, close exposure to the source case (e.g. household members).

In 2001, San Diego County TB Control identified 834 close contacts of infectious pulmonary TB cases (results of contact investigation are shown in Table 5). Six hundred ninety-two (83%) of these received an evaluation for TB infection from San Diego TB Control or from a community provider. Of contacts evaluated, 288 (42%) were found to have latent TB infection and 11 (2%) were found to have active TB disease. One hundred seventy-six patients (61%) with latent TB infection started treatment. Of these, 78 (44%) completed treatment for latent TB infection.

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	TB Control Clinics	Community Health Center Program	School Entry Screening Program	Total
Patients started on treatment*	1432	812	71	2324
Completed	898	470	60	1428
Lost	352	213	4	569
Stopped by patient	130	99	6	235
Stopped by physician: side effects	29	11	0	40
Stopped by physician: no side effects	8	19	1	28
Patient became pregnant	15	0	0	15
Completion rate	63%	57%	85%	61%

* excludes patients still on therapy and those who moved

**Table 6: Completion of Treatment for Latent Infection
San Diego County TB Control, 2000**

Treatment of Latent TB Infection (2001 Cohorts)

The majority of patients who are infected with TB do not become ill with disease immediately after infection. Most individuals achieve a state of equilibrium in which TB organisms remain alive within their body, but do not multiply and cause disease. This state is known as latent infection. Persons with latent infection remain at risk for the development of disease, known as reactivation, for the rest of their lives. The overall lifetime risk for progression from latent infection to active disease is approximately 10%. About half of this risk occurs within the first two years after infection. The risk for progression to active disease is much higher for immunosuppressed persons. For example, AIDS patients who are infected with TB have an estimated risk of developing active TB of 8% per year.

The risk of progression to active disease can be greatly reduced by providing treatment for latent infection. Latent TB is usually treated with a single medication (isoniazid) for nine months. Guidelines for treatment of latent TB infection can be obtained from San Diego County TB Control, the Centers for Disease Control and Prevention (CDC), or the American Thoracic Society.

Completion rates for treatment of latent TB infection for San Diego County TB Control Clinics and programs funded by San Diego TB Control through its cooperative agreement with the CDC's Division of Tuberculosis Elimination are shown in Table 6. In 2001, 1,432 patients were started on treatment in San Diego County TB Control clinics. Of these, 898 (63%) completed therapy.

One latent TB infection treatment program involves a partnership with local community health centers (CHCs). There are a large number of high-risk, uninsured persons within the county, for whom provision of preventive services is especially problematic. CHCs are frequently the "medical homes" for these populations because of their neighborhood locations, sliding fees, and attention to linguistic and cultural sensitivity. Since several CHCs expressed interest in improving access to TB services for these groups, contracts were signed with five CHCs in 1998. This program was expanded to include 15 CHCs in 2001. Under these contracts, the CHCs received funds for each person who started latent TB infection treatment if they were uninsured and fit a high-risk category. For the year 2001 (the most recent year for which complete data are available), 812 patients were enrolled. Of these patients, 470 (57%) completed latent TB infection treatment, 213 (26%) were lost to follow-up, and 129 (16%) stopped therapy.

A second program works with local middle and high school districts to improve access to latent TB screening, education, and treatment for predominantly Hispanic and Asian students who are recent immigrants to the United States. For the school year 2001-2002, 71 students who were enrolled in this program tested positive for latent TB and started treatment. Sixty (85%) completed therapy.

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